# Bidimensional gas-chromatography (GCxGC-ToF-MS) to evaluate the volatile profile of grappa

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***Summary:*** *Comprehensive bidimensional gas-chromatography can be used as an improved analytical tool to achieve a detailed description of a complex volatile profile in an alcoholic beverage product (grappa).*

***Keywords****: Bidimensional gas chromatography, volatile compounds, grappa*

Grappa is a traditional Italian spirit, one of the secondary products of wine production. It is obtained by distillation of fermented or semi-fermented grape pomace and its production is allowed only from grapes produced and processed in Italy. The preference of the consumers for different types of grappa depends on several aspects, among which the sensory profile is one of the most important. Indeed, grappa contains a complex mixture of hundreds of volatile compounds. Each of these compounds contributes to the aroma and flavor profiles according to their concentrations and individual sensory thresholds. The analytical characterization of grappa is crucial to evaluate its quality, safety and authenticity, thus improving the separation and identification of these compounds is an important issue. Comprehensive bidimensional gas-chromatography (GCxGC) is a powerful analytical tool to improve the resolution of volatile compounds. Differently from monodimensional GC, after the separation has taken place into the first column (first stationary phase), the compounds are transferred to a second column containing a stationary phase with a different polarity. To achieve bidimensional separations, a modulator is required to synchronize the period of time set for the mass transfer from the first to the second column either by controlled impulses of a gas flow (flow modulation) or by cycles of cold/hot jets (thermal/cryogenic modulation). Although GCxGC has been already proposed for the

characterization of distillates [1-7], the applications specifically on grappa are scarce. Therefore, the volatile profile of a commercial grappa produced in South Tyrol was characterized by SPME GCxGC-ToF-MS and compared with classical GC-MS. Furthermore, a preliminary list of sensory descriptors associated with the main volatile compounds was discussed in order to support the parallel ongoing training of a sensory panel.

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